Universität Basel
Wirtschaftswissenschaftliche Fakultät

WWZ

August 2016

The anticipation and adaptation effects of intra- and interpersonal wage changes on job satisfaction

WWZ Working Paper 2016/03

Patric Diriwächter, Elena Shvartsman

A publication of the Center of Business and Economics (WWZ), University of Basel.

Universität Basel
Peter Merian-Weg 6
4052 Basel, Switzerland
wwz.unibas.ch

Corresponding Author:
Elena Shvartsman
Tel: +41 (0) 61 207 27 54
Mail: elena.shvartsman@unibas.ch

The anticipation and adaptation effects of intra- and interpersonal wage changes on job satisfaction*

Patric Diriwächter†

University of Basel

Elena Shvartsman‡

University of Basel

This version: August 2016

Abstract

This paper analyses how individual job satisfaction is affected by wage changes. In order to account for potential dynamic effects of wage changes on job satisfaction, we include lead and lag effects of income changes in our analysis. Furthermore, we examine the role of social comparisons, i.e., how an individual's job satisfaction is driven not only by changes in his wages, but also by the size of these changes relative to wage changes within his reference group. Results from an individual fixed effects regression indicate that wage increases have a statistically significant positive effect on job satisfaction. This effect exhibits a dynamic pattern. We observe an anticipation effect of a positive wage change, i.e., individuals are more satisfied with their job one year ahead of the wage increase. Also, we find statistically significant positive, but declining effects on job satisfaction four years after the wage increase, i.e., partial adaptation. We find that an additional increase in job satisfaction is obtained when the individual's wage increase exceeds the average wage increase for his reference group. However, this effect does not appear to persist, as it is only statistically significant in the first period after the wage change.

JEL-Classification: J28, M50, M52
Keywords: wage change, job satisfaction, anticipation and adaptation

*We would like to thank Michael Beckmann, Reto Odermatt, George Sheldon, and participants of the 19th Colloquium on Personnel Economics (COPE) and the 7th Bernoulli Workshop in Economics & Psychology for their helpful comments and discussions. Data from the German Socio-Economic Panel were kindly provided by the German Institute for Economic Research. All remaining errors are our own.

†Patric Diriwächter, Faculty of Business and Economics, University of Basel, Peter Merian-Weg 6, Postfach, 4002 Basel, Switzerland, email: patric.diriwaechter@unibas.ch

‡Corresponding author: Elena Shvartsman, Faculty of Business and Economics, University of Basel, Peter Merian-Weg 6, Postfach, 4002 Basel, Switzerland, email: elena.shvartsman@unibas.ch

1 Introduction

When dealing with labour relations in economics, wages and their influence on employee behaviour and well-being are among the most prominent objects of research interest. While in traditional economic theory an employee's utility typically depends on the absolute level of his monetary outcomes, more recent evidence suggests that individuals also consider relative comparisons when evaluating their own income. Further, a growing body of the happiness research literature investigates anticipation and adaptation effects and shows that satisfaction effects may only be of transitory nature, with people returning to their initial satisfaction level within a short period of time. Combining these concepts, we focus on the effects of (relative) wage changes on job satisfaction over time. More precisely, we aim to disentangle the effects of intra- and interindividual wage changes on job satisfaction.

The study of individuals' job satisfaction has gained increasing interest as it measures the subjective evaluations of many job aspects that cannot be captured otherwise (Clark et al., 1998; Clark, 1999). Also, employers should be concerned about their employees' job satisfaction as this can be considered a determinant, for example, of an individual's job-related well-being, commitment, and turnover intentions (Johnston and Lee, 2013). Workers who are more satisfied with their jobs are assumed to voluntarily change their jobs less often and to invest more often in firm-specific human capital (Hamermesh, 2001).

[Insert Figure 1 about here]

Figure 1 presents a simple bar chart which displays a group of individuals' job satisfaction and the percentage of job changers within this group in the subsequent year. The chart clearly shows a strong negative relationship between job satisfaction and job changes; i.e., the more dissatisfied individuals were with their job, the higher was their share among job changers in the subsequent period.

On the other hand, firms have considerable discretionary power when setting wages, and thereby have the capacity to potentially affect employees' job satisfaction. The aim of this paper is thus to analyse whether individuals adjust their job satisfaction to a wage change; i.e., whether wages and especially positive wage changes buy enhanced and persistent employee job satisfaction? We analyse the adjustment to a wage change from two perspectives: (*i*) the reference point that triggers the adjustment and (*ii*) the persistence of an effect.

With regard to the first perspective, typically two types of reference points can be distinguished: an internal reference point (intraindividual or status quo comparison) and an external reference point (interindividual or social comparison) (Clark et al., 2008a). In the context of labour relations, internal reference points typically involve situations where an individual assesses his current income in terms of former incomes. We capture

this aspect by evaluating wage changes. External reference points, on the other hand, usually relate to situations where an individual compares his outcome to the outcome of similar others, for example, co-workers, which is generally referred to as making 'social comparisons'. We account for social comparisons by evaluating wage changes with respect to individual peer groups. In order to address the persistence of the wage change effect, we integrate anticipation and adaptation effects into our analysis. This allows us to capture possible changes in employee behaviour prior to a wage change and to gain insights into the persistence of these changes in behaviour after the wage change has occurred.

To the best of our knowledge, we are among the first to study the effects of intra- and interindividual wage changes on job satisfaction. Our research therefore contributes to this literature in several ways. First, we explicitly address the influence of income changes on job satisfaction, while additionally considering social comparisons as well as anticipation and adaptation effects. Second, in order to address our research question, we utilise a large representative household data set, the German Socio-Economic Panel (SOEP). This rich data set allows us to follow some individuals' careers for almost two decades. Moreover, with this data set we can control for various confounding factors, such as job characteristics which may influence job satisfaction. Finally, we include individual fixed effects in our regression in order to eliminate time-invariant unobserved heterogeneity. We find that a wage increase has a statistically significant positive effect on job satisfaction. This effect exhibits a dynamic pattern. We observe an anticipation effect of a positive wage change, i.e., individuals are more satisfied with their job one year ahead of the wage increase. Also, we find statistically significant positive effects on job satisfaction four years after the wage increase. Thus, full adaptation of job satisfaction to wage changes does not take place. Moreover, we find an additional increase in job satisfaction when the individual's wage increase is higher than the average wage increase for his reference group. In contrast to the intraindividual wage effect, the interindividual effect does not appear to be persistent, as it is only statistically significant one period after the wage change.

The remainder of this paper is structured as follows. Section 2 outlines the theoretical foundation of this paper. In Section 3, we review the related empirical literature. In Section 4, we present the data, our key variables, and descriptive statistics. Section 5 continues with our empirical strategy. In Section 6, we present and discuss our estimation results. We test the sensitivity of our results in Section 7, before Section 8 concludes.

2 Theoretical background

The theoretical foundation of relative comparisons can be found in Markowitz (1952) and Kahneman and Tversky (1979). According to the former, both present income and previous outcomes (gains or losses) determine current behavioural strategies under uncertainty.

Further, Kahneman and Tversky (1979) state in their prospect theory that individuals' decision frameworks are set such that options are evaluated with regard to a specific reference point rather than being assessed in absolute terms. However, the reference points which are conceptualised as underlying individuals' behavioural choices are influenced by contextual circumstances and may therefore change over time; for example, when a worker changes his job or is promoted (Burchardt, 2005; Johnston and Lee, 2013).[1]

The concept of social comparisons originated from the "relative income hypothesis" by Duesenberry (1949). In the context of consumer behaviour, he argues that individuals feel relatively deprived, when their own status level is below the status of similar others. Consequently, individuals will try to catch up and eliminate existing inequalities by increasing their own expenditures (Duesenberry, 1949). The theory of social comparison processes introduced by Festinger (1954) and the equity theory of Adams (1963, 1965) further contributed to the topic with more emphasis on labour relations. In both theories, comparisons to similar others also have behavioural consequences and influence individual utility. Furthermore, social comparisons can reveal information about future earnings or career prospects.[2] Thus, the direction of the effect of social comparisons on individual well-being is a priori unclear, and as a result two opposing effects are generally distinguished: "status" or "envy" effects versus "signal" or "ambition" effects (Clark and Senik, 2010). The first effect concerns situations where an individual's well-being is reduced when that individual is worse off than others in the respective reference group, i.e., social comparison income and individual well-being are negatively correlated. In contrast, the second effect relates to situations where individuals' well-being is enhanced, when they perceive similar others to be better off than themselves. This primarily relates to situations where individuals expect to soon catch up with that of similar others. In this case, the amount of social comparison income and an individual's well-being are positively correlated. Hence, the resulting net effect consisting of the conflicting status and signal effects of social comparisons on well-being remains an empirical question.

Aside from the a priori ambiguous outcomes of social comparisons, the following example illustrates, why we should consider social comparison effects as an influencing factor of job satisfaction in addition to assessing income changes with respect to the individual's past. Assume, for example, a worker who faces a wage cut in one year. Compared to his wage before the wage cut, the worker is obviously worse off. Therefore, we would expect the worker to state lower subjective job satisfaction. However, if his co-workers'

[1] A theoretical model for reference-dependent preferences with endogenously determined reference points based on individual expectations has been developed by Köszegi and Rabin (2006). More precisely, reference points in their theoretical framework are determined by the economic environment and expectations in the past about future outcomes. Ultimately, this results in lower individual utility if expectations are not met.

[2] The signal effect of social comparisons dates back to the "tunnel effect" described by Hirschman and Rothschild (1973).

wages happened to shrink even more than his, for example because of a bad firm- or industry-specific shock, the worker's perception of his own situation might change. By making social comparisons, the worker is now better off than previously with respect to his colleagues. So despite being worse off when comparing past and present wages, the overall satisfaction effect, which includes social comparisons, may now be neutral or even positive. Owing to this effect, it is possible that we may not observe differences in job satisfaction before and after the wage cut (or wage raise, respectively).

The phenomenon of adaptation builds on this relative comparison framework and is also embedded in Brickman and Campbell's (1971) "hedonic treadmill" hypothesis. They state that major events merely lead to short-lived changes in well-being with individuals subsequently returning to their baseline level.[3] Powdthavee (2011, p. 1003) argues, that "(...), adaptation generally refers to the decline in satisfaction over time after the event has occurred." Adaptation is expected to be especially relevant when facing extrinsic rewards, for example, wages (Frey and Stutzer, 2014).[4] It is important to note that adaptation can also be incomplete or partial. For instance, Oswald and Powdthavee (2008) observe that people who are victims of a severe disability only partially return to their earlier life satisfaction level.[5] This theory of adaptation implies that, conditional on wage changes having an impact on job satisfaction, the effect is expected to only be temporary, with individuals quickly returning to their baseline satisfaction levels. Related to the concept of adaptation is the idea of anticipation, i.e., the assumption that an individual's current satisfaction will increase owing to an expectation of a favourable life event in the near future (e.g., Di Tella et al., 2010; McBride, 2010; Clark et al., 2008b). Loewenstein (1987) includes the concept of anticipation based on Jevons' (1905) idea of "anticipal pleasure" and "anticipal pain" in a standard discounted utility model framework. In his model, the anticipation of future consumption enhances an individual's current utility. In doing so, the utility gained from anticipation is positively influenced by the duration of consumption and the utility of consumption itself, but negatively influenced by the time span until the consumption takes place (Loewenstein, 1987). However, the anticipation utility rises at an increasingly disproportionate rate, the closer the moment of actual consumption is (Loewenstein, 1987). If there is an anticipation effect associated with wage changes, then we expect job satisfaction to increase or decrease (depending on the direction of the wage change) in advance of the actual wage change.

[3]For more background information on adaptation, see the changing expectations concept of Helson (1947), the adaptation-level theory of Helson (1964), and the "preference drift" concept of van Praag (1971). For a survey of hedonic adaptation, see, for example, Frederick and Loewenstein (1999).

[4]In contrast, Frey and Stutzer (2014) argue that there is less or no adaptation to intrinsic rewards, for example, meeting friends.

[5]Clark and Georgellis (2013) note that it is especially difficult to distinguish between adaptation and learning when dealing with disability, since instead of getting used to their disability, disabled people may also have acquired helpful techniques which make their lives easier to handle.

3 Related literature

In his seminal contribution, Easterlin (1974) observed that happiness did not increase in the post-World War II period in the United States despite a considerable growth in income. Ever since his publication, subjective well-being has gathered substantial attention in economics and other social sciences, especially in recent years (Clark and Georgellis, 2013; Ferrer-i-Carbonell and Frijters, 2004). While in cross-sectional analyses wealthier countries tend to be happier, this phenomenon cannot be observed within one country over time, a fact today known as the Easterlin paradox (Clark et al., 2008b; Di Tella and MacCulloch, 2006; Di Tella et al., 2010).[6] Di Tella and MacCulloch (2006) and Clark et al. (2008a) mention happiness adaptation to income changes and social income comparisons as two main explanations for the paradox.

Over the past few years, a strand of well-being literature has emerged which studies individuals' anticipation in expectation of, and adaptation in response to major life events. Within this domain, some studies predominantly focus on the adaptation of individuals' life satisfaction to income changes (e.g., Di Tella et al., 2010; Ferrer-i-Carbonell and van Praag, 2008).[7] While standard economic theory predicts zero adaptation to major life events, puzzling research evidence shows that major life events only have small, temporary effects on individuals' reported happiness, i.e., that full or at least partial adaptation occurs (Kahneman and Krueger, 2006). For example, the cross-sectional study of Brickman et al. (1978) which considers the life satisfaction of lottery winners finds similar life satisfaction levels between lottery winners (who won a lottery in the previous year) and non-winners.[8] A similar study was conducted by Gardner and Oswald (2007), which focuses on a small sample of lottery winners in the British Household Panel Survey (BHPS). Contrary to Brickman et al. (1978), their results yield positive effects of medium-sized lottery wins on mental well-being. Di Tella et al. (2010) study happiness adaptation to income and status changes in the SOEP. They find evidence for complete happiness adaptation to income changes within four years. However, they find no evidence for adaptation to status changes in their analysis. Drawing data from the BHPS and focusing on satisfaction with income, Burchardt (2005) provides evidence that adaptation effects may be asymmetric, in that people are more likely to adapt to income rises than to

[6] Later, Easterlin (1995) reconfirmed his earlier findings for the United States, nine European countries, and Japan. Most recently, Easterlin (2016) again states that the paradox holds for the United States and several developed, emerging and less developed countries worldwide, when long-term trends in subjective well-being are properly taken into account. See also Blanchflower and Oswald (2004) for evidence on the Easterlin paradox for the United States and the UK.

[7] A literature review can be found in Clark et al. (2008b) and in Di Tella and MacCulloch (2006). An overview of the literature on subjective well-being can be found in Frey and Stutzer (2002) and Senik (2005).

[8] However, the sample size in Brickman et al. (1978) with 22 lottery winners and a control group of 22 individuals living in the same city area as the winners is rather small.

income cuts. In contrast, the results of Ferrer-i-Carbonell and van Praag (2008) suggest that there might be happiness adaptation to wage cuts. However, they find no adaptation in response to wage increases.

Considering income on a macroeconomic level, Di Tella et al. (2003) find evidence that GDP influences happiness using European data from the Euro-Barometer Survey Series and US data from the General Social Survey (GSS). Further, their results indicate happiness adaptation to GDP changes, though adaptation in their data seems to be incomplete. Focusing on the relationship between income and well-being but ignoring adaptation effects, Powdthavee (2010) evaluates the causal effect of income on happiness in the BHPS by instrumenting household income with the proportion of household members who present their wage statement to the interviewer. He concludes that by addressing possible sources of endogeneity, the income effect on happiness almost doubles compared to more basic specifications. Frijters et al. (2004) use the German reunification as a natural experiment to assess the influence of income increases in the post-reunification phase on life satisfaction in former East Germany. Average life satisfaction rose considerably in the period 1991-2001, whereby around 35-40 percent of this increase in well-being can be attributed to the rise in income over this period (Frijters et al., 2004).

Besides income changes, further changes in life circumstances that have been examined are, for instance, changes in marital status (e.g., Lucas et al., 2003; Lucas, 2005; Lucas and Clark, 2006; Gardner and Oswald, 2006; Stutzer and Frey, 2006; Zimmermann and Easterlin, 2006), and disability (e.g., Oswald and Powdthavee, 2008; Powdthavee, 2009). Multiple life events are considered, for example, in Clark et al. (2008b), Clark and Georgellis (2013), Frijters et al. (2011), and Rudolf and Kang (2011). Overall, the evidence is rather indecisive, ranging from zero to full adaptation. For example, Lucas et al. (2003) find that people experience a positive boost in happiness ("honeymoon effect") around the date of their marriage and, on average, adapt completely to the baseline level in the two subsequent years. In contrast, adaptation to widowhood seems to be rather slow and incomplete, with full adaptation being nearly achieved only after a period of 8 years of widowhood (Lucas et al., 2003).[9] Furthermore, Lucas et al. (2003) note that individual variability in the extent to which people adapt to life events is high. Zimmermann and Easterlin (2006) identify a similar honeymoon effect, but report that life satisfaction remains significantly above the pre-marriage level in the years following marriage, indicating only partial adaptation.[10] Clark et al. (2008b) find complete adaptation regarding happiness in the SOEP for marriage, divorce, widowhood, birth of a child, and

[9]Lucas and Clark (2006) re-analyse and reconfirm the findings of Lucas et al. (2003) who identify full adaptation to marriage. They additionally control for cohabitation effects before marriage, as suggested by Easterlin (2005).

[10]Zimmermann and Easterlin (2006) mention the absence of controls for negative life circumstances in the study by Lucas et al. (2003) as an explanation for the differing results.

layoffs, while unemployment seems to have long lasting negative effects on individuals' life satisfaction.[11] They additionally find that individual reported well-being already deviates from the baseline satisfaction level in advance; i.e., individuals strongly anticipate most of the life events considered.[12] Using quarterly data on multiple life events of the Household, Income and Labour Dynamics in Australia (HILDA) survey, Frijters et al. (2011) find evidence for anticipation, adaptation, and selection effects in life satisfaction.[13] For most life events, the authors find that people adapt almost completely within two years, except for changes in financial situation, death of a close relative, and serious illness. In sum, the degree to which people adapt to changing circumstances seems to depend on the respective life event and on personal characteristics, indicating the importance to control for individual fixed effects.

Since we employ a more job-related focus in our study, we are interested in whether wage changes lead to changes in overall job satisfaction and if these changes are of a permanent nature. Adaptation of job satisfaction to income changes has attracted much less attention than the life satisfaction-income relationship. Studies that are closest to ours, which explicitly address job satisfaction and income changes, are for instance Clark (1999), who examines current income and income changes in the BHPS, and Grund and Sliwka (2007), who theoretically and empirically evaluate the influence of current wages and wage increases on job satisfaction using the SOEP. Both these studies assess an individual's wage change with respect to an individual's wage in the previous period as reference point. In line with reference-dependent well-being considerations, Clark (1999) finds evidence for job satisfaction being positively associated with wage changes, while the current wage level and job satisfaction seem to be unrelated in his data. In contrast, Grund and Sliwka (2007) conclude that job satisfaction is positively influenced by wage increases as well as by an individual's absolute wage level. They additionally find that with rising wages, attaining further wage increases becomes more and more challenging, leading to declining job satisfaction over time. A recent study by Smith (2015) considers the effects of the wage level and changes on job satisfaction using the first 17 waves

[11] See also, for example, Lucas et al. (2004) and Clark (2006).

[12] Clark et al. (2008b) report anticipation effects for unemployment, marriage, divorce, birth of a child, and layoffs, but only weak evidence of anticipation effects for widowhood. Since some of these life events are often planned or foreseen and since most of them involve major life changes, rather than simple adjustments associated with wage changes as in our case, it is not surprising that the authors, to some extent, find quite long anticipation periods.

[13] Frijters et al. (2011) focus on change in financial situation, involuntary job loss, change in marital status, change in residence, birth/adoption of a child, death of a close relative, serious illness/injury, and being victim of a crime. The selection effect captures the idea that some individuals are more likely to experience a certain life event than others (Frijters et al., 2011). Clark et al. (2008b) include individual fixed effects in their regressions to ensure that the lead variables actually represent anticipation and not selection. Further, Frijters et al. (2011) note that the use of yearly life event data may lead to an underestimation of the true anticipation and adaptation effects. Also, effects are likely to be underestimated when anticipation effects are ignored and studies stick to cross-sectional data (Frijters et al., 2011).

of the BHPS. She finds significant positive effects of the wage level and wage increases on job satisfaction. Other studies deal with job satisfaction using the SOEP are, for instance, Clark et al. (1998), who focus on job satisfaction and job quits, Hamermesh (2001), who analyses changes in income inequality and the distribution of job satisfaction, and Hanglberger and Merz (2015), who deal with the effects of self-employment on job satisfaction.[14] Further, Powdthavee (2011) addresses the effects of union membership on job satisfaction in the BHPS and Johnston and Lee (2013) evaluate how promotions affect job satisfaction using data from the HILDA survey. The latter also consider anticipation and adaptation effects in their study and find significant positive effects of promotions on individual job satisfaction. They find that promotion effects diminish and individuals return to their baseline satisfaction level (full adaptation) three years after a promotion, while they identify no evidence for anticipation effects prior to promotions (Johnston and Lee, 2013).[15] Since promotions are usually associated with wage increases,[16] the results of Johnston and Lee (2013) may suggest that individuals not only adapt to promotions, but also to wage changes. Dealing with UK data on university graduates, Lydon and Chevalier (2002) show that the direct wage effect on job satisfaction almost doubles, when controlling for possible endogeneity using the wage of the graduate's partner as an instrument for an individual's wage. Further, they mention that job satisfaction depends on past and future wages.

Aside from using an individual's past wage as an intraindividual reference point for evaluating worker well-being or utility, further evidence can be identified by using an interindividual reference point, i.e., social comparisons (e.g., Clark and Oswald, 1996; Clark et al., 2008b; Ferrer-i-Carbonell, 2005; Luttmer, 2005; McBride, 2001). Using data from the National Survey of Families and Households (NSFH), Luttmer (2005) finds negative happiness effects when the income of an individual's neighbours increases. Furthermore, Clark (2003) finds that a higher unemployment rate in an individual's reference group has a mitigating effect on an individual's declining life satisfaction when he becomes unemployed. Stutzer (2004) finds evidence for life satisfaction being negatively influenced by an individual's "aspiration level", in that an individual's income aspiration level increases with the individual's own income level and with the social comparison income. Evaluating white-collar executives in the German chemical sector and considering wage changes as well as social comparisons, Grund and Martin (2015) find that social comparisons at the firm- and the market-level are both positively related to job satisfaction.[17] In sum, the

[14] Hanglberger and Merz (2015) also consider anticipation and adaptation effects in their analysis.

[15] Controlling for the current wage level and social comparison effects, Kosteas (2011) finds evidence for positive but declining effects of promotions on job satisfaction three to four years after a promotion (indicating partial adaptation), using the waves 1996-2006 of the NLSY79 dataset. Further, his results indicate that anticipation effects take place, as individuals report being more satisfied when they believe a promotion is possible within the next two years.

[16] See, for example, Johnston and Lee (2012)

[17] However, when controlling for firm-related pay variables, wage changes (assessed as deviations from

evidence so far suggests that people actually care about social comparisons.

Although, the implications of wage changes on job satisfaction seem essentially straight forward, further research on this topic is necessary. Not only are we interested in whether wage changes lead to changes in overall job satisfaction, but also whether these changes are of a permanent or temporary nature. Overall, the literature reviewed stresses the importance of anticipation and adaptation in well-being research. Especially with respect to job satisfaction, the evidence is rather scarce and does not yet address the lead and lag dynamics of wage changes adequately. Further, existing studies have emphasised the importance of social comparisons in wage discussions. Since adaptation and anticipation considerations may significantly modify the effects of major life events, we enlarge current empirical approaches by simultaneously considering anticipation and adaptation effects as well as social income comparisons in our analysis.

4 Data

We use data from the German Socio-Economic Panel (SOEP) for our analysis.[18] The SOEP is an annual longitudinal household survey which has been conducted since 1984 and is considered to be the most important representative household survey in Germany. The SOEP questionnaires contain a wide range of individual and job-related characteristics, including variables on different aspects of individual well-being.[19,20] We use data covering the years 1990 to 2013. Note, however, that data from the first four years and the last year are not included directly in our estimations, as we use this information in order to construct anticipation and adaptation effects, respectively. For the same reason, we are only able to include individuals, who were interviewed in at least six consecutive years. Also, it should be mentioned that the SOEP is not designed as a balanced panel, as over the course of the years individuals drop out of or enter the sample. Therefore, we conduct our main analysis on the basis of an unbalanced sample containing 32,606 observations with an average panel length of T=5.5.[21]

We restrict our sample to workers aged between 18 and 65.[22] Self-employed individuals, civil servants, individuals enrolled in the army or civil service, and apprentices are excluded from the sample. Furthermore, we restrict our sample to full-time employees in order to ensure that increased job satisfaction is not merely due to a (desired) increase in working

a worker's average wage level) and job satisfaction seem to be unrelated (Grund and Martin, 2015).

[18]Socio-Economic Panel (SOEP), data for years 1984-2013, version 30, SOEP, 2015, doi:10.5684/soep.v30.

[19]For more detailed information about the SOEP, see Wagner et al. (2007).

[20]The original questionnaires and their English translations can be retrieved online http://www.diw.de/de/diw_02.c.238114.de/frageboegen_methodenberichte.html.

[21]T excludes the extra five years necessary to form anticipation and adaptation effects.

[22]As we include one anticipation and four adaptation periods, the actual age of our sample ranges between 22 and 64 years (compare Table A.1 in the Appendix).

hours; i.e., the switch into full-time employment.[23] Finally, we follow Clark (1999) in clearing outliers, who report wage changes of below -50% or above 100%. The descriptive statistics for all variables are reported in Table A.1 in the Appendix.

Our dependent variable is overall job satisfaction, which is the response to the question "How satisfied are you with your job". This question is asked on an annual basis in the SOEP. The possible answers range from 0 ("totally unhappy") to 10 ("totally happy"). Table 1 presents the descriptive statistics of this variable for our main sample, split by gender. We observe a bunching towards higher values, which is a frequent pattern in well-being data (Clark et al., 2008b). The modal response for both sexes is 8, and only about 5% of our sample report the highest value of 10.

[Insert Table 1 about here]

Our explanatory variable is the wage change of individual n at time t. In our main specification, we calculate the percentage change in an individual's gross wage as compared to the year before the survey.[24] As our goal is to examine the anticipation and adaptation effects of a wage change, we also include lag and lead variables of an individual's wage change in our analysis. We follow Di Tella et al. (2010), who also use the SOEP for their similar research question in specifying one anticipation period and four adaptation periods.[25]

Furthermore, we are interested in the social comparison aspect of a wage change. There are many reference groups that people potentially compare themselves to, such as family members, friends, neighbours, and work colleagues. In our context, however, since we are concerned with job-related attributes, co-workers seem to be the appropriate reference group (Clark and Senik, 2010).[26] Since we cannot identify co-workers in our data, we try to approximate the "co-worker reference group" by using various individual and job-related characteristics when creating the reference groups. In specific, we construct peer groups with respect to the observation year, gender, age group, level of education, region (East and West Germany), and the industry sector.[27] On average, our peer groups consist

[23] This restriction and the fact that we require to observe individuals for at least six consecutive years (in employment) leads to our sample being over proportionally male. Men constitute approximately 70% of our sample (compare Table A.1 in the Appendix).

[24] The precise question in the SOEP refers to the "(gross) income from employment last month."

[25] Although Di Tella et al. (2010) note that the choice of this specific lag structure is rather arbitrary, we consider our lag structure to be well suited to the context. Most importantly, a longer lag structure would deprive us of many observations, since the requirement of our empirical strategy is to consecutively observe individuals for the total lead and lag period. With respect to our choice of including one anticipation period, we think that it is unreasonable to assume that an individual derives utility from an expected wage increase more than a year in advance.

[26] Clark and Senik (2010) find that with respect to income, most individuals compare themselves to work colleagues. Further, they state that the likelihood of reporting work colleagues as the primary reference group increases with an individual's evaluation of the importance of social comparisons.

[27] The age groups are: younger than 25, 25-35, 35-45, and older than 45.

of approximately 50 members. We then calculate the percentage point difference between the individual's own wage change and the peer group's wage change and generate a dummy variable taking on value 1, if this difference is positive, and value 0 if this difference is zero or negative.[28,29] Thus, our social comparison variable catches whether an individual derives additional job satisfaction if his own wage change is larger than that for his peer group. We chose to include a dummy and not the percentage point difference itself in our calculations due to our approximate construction of peer groups. We prefer to rely on the general direction of the difference; i.e., whether the wage change is below or above the peer group's wage change. For the same reason, we do not restrict our dummy construction to certain minimum or maximum values, but consider the entire range of possible differences to the peer group.[30]

Table 2 presents the summary statistics for our dependent and main explanatory variables. While both the average individual wage and the average peer group wage are approximately 3000€, the standard deviation for the individual wage is much higher than for the peer group wage, as the latter is the average of the mean wage of groups with several individuals. Furthermore, the average wage change (over all periods) in our sample is 4%, and the average peer group wage change is roughly in the same range as are the changes' standard deviations and with-in standard deviations. Given these similar distributions, we conclude that we have succeeded in constructing appropriate peer groups for the individuals in our sample.

[Insert Table 2 about here]

5 Empirical Strategy

The aim of this analysis is to identify the effect of a wage change on individual job satisfaction. Therefore, we start our analysis with a simple regression of an individual's n job satisfaction in time t, denoted $jobsat_{nt}$, on a wage change in time t, wch_{nt}.

$$jobsat_{nt} = \alpha_0 wch_{nt} + X_{nt}\delta + f_n + \eta_t + \epsilon_{nt}. \quad (1)$$

[28]The difference between an individual's n own wage change and the respective peer group's wage ($peerwage$) change in time t is calculated in the following way: $wagedif_{nt} = \frac{wage_{nt} - wage_{nt-1}}{wage_{nt-1}} - \frac{peerwage_{nt} - peerwage_{nt-1}}{peerwage_{nt-1}}$.

[29]For individuals without any comparable peers as defined by the specified grouping criteria, we replace the reference group wage with the individual's own wage in the respective period. By proceeding in that way, we do not lose observations if individuals do not have a peer group in a specific observation period. In our dummy variable construction, this procedure means that individuals without peers are in the reference category. If we drop individuals without a 'real' peer group from our analysis, the results remain qualitatively the same. The results are not reported here, but are available from the authors upon request.

[30]However, we also considered to include the peer group effects as percentage point differences into our analysis. This is further discussed in footnote 37 in Section 6.

In equation (1), f_n is the individual-specific, time-invariant effect, η_t is a time fixed effect captured by a set of time dummy variables, and ϵ_{nt} denotes an idiosyncratic error term with zero mean and finite variance. As the estimation of the effect of a wage change on job satisfaction may be confounded by several observed factors, we include a large set of control variables denoted by the vector X in our estimation.

The vector X includes individual characteristics such as age, age squared, years of schooling, gender, nationality, marital status, the existence of children in the household, an individual's self-reported health status, as well as the number of hours devoted to leisure-time activities.[31,32] Our set of control variables is further enriched with job characteristics and variables from an individual's employment history that may affect job satisfaction. These variables include an individual's wage in period t, his weekly actual working hours, the type of employment contract (fixed-term vs. permanent), whether an individual has changed his job as compared to the previous observation period, the tenure with the respective company, and the number of years that an individual has experienced in unemployment and part-time occupations, respectively. The job-specific variables also include 10 occupation-level dummies. Also, we add dummies for the size of the company at which the individual is employed and for the company's sector affiliation. Finally, we include regional dummies for the worker's place of residence ("Bundesland") into the set of our control variables. Table A.1 in the Appendix provides the definitions and descriptive statistics of the complete set of variables used in this study.

Equation (1) is estimated using both the pooled OLS (thereby ignoring f_n) and the within estimator. Following the happiness literature, we apply linear regression techniques and thereby treat our dependent variable, job satisfaction, as metric. Ferrer-i-Carbonell and Frijters (2004) show that when analysing happiness data it is far more important to account for individual fixed effects than for the ordinal scale of the dependent variable. The advantage of specifying a fixed effects model is that time-invariant unobserved heterogeneity can be eliminated. In the present case, an example for unobserved heterogeneity is an individual's general attitude to life or optimism.

Although we employ a rich set of control variables, and account for time-invariant unobserved heterogeneity, our first specification does not consider possible anticipation and adaptation effects. Without adaptation effects, we are not able to distinguish whether a wage change has a short-lived or persistent effect on an individual's job satisfaction.

[31] Time-invariant variables such as years of schooling, gender, age, age squared, and nationality are excluded from the set of control variables when estimating the fixed effects model.

[32] We also ran our main specification under inclusion of private life events that happened in the year of the observation (birth of a child, a separation or divorce from partner or spouse, and the death of a close relative), in order to account for confounding factors from an individual's private life that may influence job satisfaction. Since these items were only collected since 1999, the consideration of these control variables in our main specification would have considerably reduced our sample. Results under the inclusion of these control variables remain qualitatively the same, but are not reported here.

Therefore, we extend our regression model as follows:

$$jobsat_{nt} = \alpha_0 wch_{nt} + \alpha_1 wch_{nt+1} + \sum_{i=1}^{4} \alpha_{-i} wch_{nt-i} + X_{nt}\delta + f_n + \eta_t + \epsilon_{nt}. \tag{2}$$

In equation (2), wch_{nt-i} are the adaptation effects to wage changes that occurred i periods before t. The inclusion of such effects allows us to test whether individuals fully adapt to a wage change. If no adaptation takes place, then the null hypothesis of $\alpha_{-i} = 0$ should be rejected.[33] At the same time, we should not ignore the possibility that an individual's satisfaction with his job may increase in anticipation of a wage increase at the end of the year. Given this assumption, the evaluation of simple before and after comparisons would lead to an underestimation of the true wage change effect on job satisfaction. So, wch_{nt+1} is the anticipation effect to a wage change that will occur one period after t. By including wch_{nt+1} in our regression analysis, we can capture possible changes in employee behaviour which are elicited by the prospect of receiving a wage change and thereby address possible selection effects (Johnston and Lee, 2013). By incorporating individual fixed effects, f_n, the estimated effect of the lead variable reflects effects of anticipation rather than the selection which could occur because, certain events are more likely for certain people, for instance, more satisfied individuals are also those receiving wage increases (see Clark et al., 2008b, p. F223). As it seems implausible that people anticipate minor life events several years in advance, we address possible anticipation effects by focusing on the most recent year before a wage change. In contrast to the case of adaptation, the null hypothesis of $\alpha_1 = 0$ should be rejected if individuals anticipate wage changes. Lastly, in equation (2), we enrich our set of control variables X by including dummies for job changes in all lead $(t+i)$ and lag $(t-i)$ periods. We thereby control for the case that a higher reported job satisfaction is merely due to a new job and not a wage change per se.

Finally, we are also interested in the effect of social comparisons. Therefore, we extend equation (2) in the following way:

$$\begin{aligned} jobsat_{nt} =& \alpha_0 wch_{nt} + \alpha_1 wch_{nt+1} + \sum_{i=1}^{4} \alpha_{-i} wch_{nt-i} \\ &+ \beta_0 dtp_{nt} + \beta_1 dtp_{nt+1} + \sum_{i=1}^{4} \beta_{-i} dtp_{nt-i} + \\ &+ X_{nt}\delta + f_n + \eta_t + \epsilon_{nt}. \end{aligned} \tag{3}$$

In equation (3), dtp_{nt}, dtp_{nt-i}, and dtp_{nt+i} are the corresponding dummies indicating whether an individual's wage change in the respective period was above or below his peer group's wage change. The null hypothesis of $\beta_{-i} = 0$ and $\beta_1 = 0$ should be rejected, if

[33] Note that if there was no adaptation at all, we would expect all coefficients, i.e., all values of α, to be of approximately the same size (Clark et al., 2008b).

there is an additional effect of social comparisons on job satisfaction.

It should be mentioned that, while we account for possible endogeneity due to a bias that may arise if personality traits drive both wages and job satisfaction by considering fixed effects, our empirical strategy does not allow us to consider possible endogeneity due to a simultaneity bias. A source for this simultaneity bias could be, for instance, that satisfied employees signal more motivation and are therefore more likely to receive a wage increase. We considered to instrument wage changes, however, we did not succeed in finding a useful instrument for wage changes that would have satisfied the exclusion restriction, and, at the same time, leave us with a sample size comparable to the one in our main regression analyses.[34] Di Tella et al. (2010, p. 845) comment on a similar issue, where they regress life satisfaction on income and status: "Note that our status estimates may also be affected by a simultaneity bias (but the literature has not so far explored possible instruments)." Finally, we borrowed on the idea of Lydon and Chevalier (2002), who instrument individuals' wages with the wages of the their partners by instrumenting the individuals' wage changes with the wage changes of their partners. Since we require the individuals in our sample to be employed in full-time and therefore only instrument individuals' wage changes when their partner is also employed in full-time, the resulting instrumental variables (IV) sample constituted less than 6,000 observations. Therefore, we restrained from further following the IV approach and only briefly mention the associated results in footnote 36 in Section 6.

6 Results

The estimation results of our regression analyses on the effects of a wage change on job satisfaction are presented in Table 3. Columns (1)-(3) of Table 3 display the estimation results according to equation (1). In column (1), we present a regression of individual's n job satisfaction in t on his wage change in t without control variables in order to show an unconditional correlation between these two variables. Column (2) displays the same regression with control variables X, and in column (3) we additionally control for time-invariant unobserved heterogeneity by including individual fixed effects. In all three regressions, the coefficient of the wage change is positive and statistically significant at the 1% level, indicating that there is a strong association between a (positive) wage change and job satisfaction.

[Insert Table 3 about here]

While these first results seem rather straightforward, the persistence of such a positive effect on job satisfaction is our primary interest. Therefore, in column (4) we present the

[34] A typical exogenous source of wage variation would be, for example, variation in the state of the economy. However, this instrument would be likely correlated with job satisfaction.

results from equation (2), which account for anticipation and adaptation effects. We see that the null hypothesis of $\alpha_{-i} = 0$ and $\alpha_1 = 0$ can be rejected for all but the last two adaptation coefficients. This means that, individuals already exhibit a significantly higher job satisfaction one period before a wage increase takes place and do not fully adapt (i.e., do not return to their baseline job satisfaction) for two periods following a wage change. However, the last two coefficients, α_{-3} and α_{-4}, do not differ statistically significantly from zero, meaning that full adaptation takes place three periods (in our case years) after the wage increase.

In columns (5) and (6), we present results from equation (3). In this specification, we include the dummies for whether the wage changes were above the respective peer group's wage changes. We start by setting $\alpha_1 = \alpha_0 = \alpha_{-1} = ... = 0$ in equation (3). The results from this regression are presented in column (5). We see that the immediate effect of having a wage increase larger than the peer group's wage increase is positive and statistically different from zero at the 1% significance level. We also find a significant coefficient for the first lag, whereas the following lags as well as the lead coefficient remain statistically insignificant. The coefficients of lag three and four even exhibit a negative sign, but given their small size and statistical non-significance we do not find this worrisome. From this specification, we conclude that individuals derive job satisfaction when their wage increase surpasses the one of their peers, but that this additional satisfaction only lasts for a total of two periods.

Finally, we present the results from the unrestricted equation (3) in column (6), our preferred specification. In this specification, we combine the intra- and interindividual effects into one regression. The estimated coefficients for the interindividual effects in column (6) are smaller than in column (5) and further lose statistical significance. In column (6), only the coefficient of the first lag remains statistically significant at the 10% level.[35] With respect to the intraindividual effects, the results in column (6) differ from the results presented in column (4) insofar as the coefficients from lag three and four for the individual's wage change now also become statistically significant. The hypothesis that full adaptation takes place within four periods must, therefore, now be rejected. As the effect clearly diminishes over time, we speak of partial adaptation. However, we treat this result with caution as the coefficients only exhibit statistical significance at the 10%

[35]The null hypothesis that the coefficients of the interindividual effects are jointly equal to zero (F-test) cannot be rejected at the 10% level.

level and were not significant in the previous specification.[36,37]

The obtained results are also graphically depicted in Figure 2a. The figure shows that there is a considerable effect one period prior to the wage change, and that it is largest in the period when the wage change takes place. It steadily decreases thereafter, but as mentioned before, remains statistically significant for all considered periods (four) after the wage change. Put in numbers, in the period of the wage change itself, a one-percent increase in wages translates into a 0.44 point increase in job satisfaction, which is roughly one quarter of a standard deviation for this variable. So, for the average individual his job satisfaction would shift from 6.94, which is the mean value of our sample, to 7.38 points. Additionally, individuals experience a 0.29 point increase in job satisfaction from merely anticipating a wage change in the period preceding its realisation, and an effect of roughly the same size in the period after this. Since we cannot identify and therefore control for small-scaled promotions in our data (i.e., promotions that are neither associated with employer changes nor with position changes within a firm) we additionally attribute increased job satisfaction due to a wage increase to promotions. If individuals anticipated promotions and were more satisfied with their jobs ahead of a promotion as well as did not immediately adapt to the increased job satisfaction which they derived from an actual promotion, we would likely observe these effects in form of statistically significant coefficients of our wage change variables. That is, because we assume that a promotion not only increases job satisfaction through a salary increase, which we account for, but also increased task autonomy and decision competences. Thus, although our job change dummy is expected to control for most promotions, i.e., those associated with employer changes or position changes within a firm, we cannot rule out that a part of the observed effect is due to promotions and that our coefficients may therefore be somewhat overestimated.[38]

[36] Apart from regressing job satisfaction on wage changes according to our main specification, we also implemented an IV approach, where we instrumented the individual's wage change with his partner's wage change. The instrument for the wage change in t and the respective leads and lags provided, with the exception of the last lag $(t-4)$, F-statistics for instrument relevance of above 10. Therefore, the chosen instruments do not appear to be weak instruments. However, we restrained for two reasons from further following this approach. First, due to the methodological restriction of considering full-time employees only, this resulted in a very small sample of below 6,000 observations, which is not comparable to our main results with a sample size of over 30,000 observations. Second, the C-test does not reject the hypothesis of exogenous intraindividual wage changes as well as their leads and lags (p-value 0.123). Therefore, we conclude that it is not necessary to instrument our set of explanatory variables. Also, the FE model produces smaller standard errors than the IV approach and is therefore more efficient.

[37] Also, we replaced the peer effect dummies by the respective percentage point differences. Compared to our main specification, the results resembled those in column (4), i.e., the last two lags of intraindividual comparisons were not statistically significant in this specification suggesting again full adaptation after two periods following the wage change. Furthermore, the weak interpersonal effect for the first lag completely disappeared in terms of statistical significance.

[38] Yet, it remains unclear to what extent workload rises with promotions. In this respect, our obtained results may also be underestimating the true effect of a wage change, because a heavier workload is likely to have a detrimental effect on job satisfaction.

[Insert Figure 2 about here]

As for the social comparison effect, it is now even weaker than before with only one weakly significant coefficient; namely, the one of the first lag. This can also be seen in Figure 2b. We suppose that including the intrapersonal wage comparison absorbs most of the the previously observed interpersonal effect.

In sum, our results support reference-dependent preferences with well-being depending not only on absolute, but also on relative considerations. In our case, intrapersonal comparisons seem to be more substantial than social comparisons. In line with Clark (1999) and Grund and Sliwka (2007), we find that job satisfaction is positively correlated with intrapersonal wage changes. Moreover, the observed effect on job satisfaction is strongest in the period the wage change occurs. Similar results concerning the peak impact of several life events on well-being have been found by Clark et al. (2008b).

Further, we find evidence for considerable anticipation and adaptation effects on job satisfaction from wage changes. First of all, individuals seem to anticipate future wage changes one period prior to the occurrence of the change. Positive anticipation effects have also been found by Di Tella et al. (2010), with changes in income between the current and the subsequent year having a significant impact on current life satisfaction. Similarly, Lydon and Chevalier (2002) find that future wage expectations significantly influence current job satisfaction. Second, the effects of wage changes appear to be of transitory nature, with people at least partially or even fully returning to their baseline satisfaction level within a short period of time. Thus, our results to some extent support Di Tella et al. (2010), finding full adaptation to income within four years. An individual's partial adaptation to improvements and worsening of his own financial situation have been reported by Frijters et al. (2011). In addition, they find evidence for asymmetric effects in response to financial changes, with financial worsening showing considerably larger effects than financial improvements.[39] Strong adaptation effects have also been reported by Johnston and Lee (2013), with job satisfaction returning to the baseline level three years after receiving a promotion.[40]

Our results concerning social comparisons weakly indicate the existence of interpersonal preferences. More specifically, our findings support the idea of status effects outweighing potential signal effects. When considering social comparisons without accounting for intrapersonal aspects, having a wage change above the wage change of the respective peer group appears to temporarily enhance job satisfaction. Similarly, Ferrer-i-Carbonell (2005) found that individuals' happiness increases with the difference between their own

[39] When considering the underlying questions, this asymmetry is not necessary surprising. When asking about financial worsening, the question refers to "went bankrupt", which appears to be a far more dramatic life event than "winning a lottery" or "receiving an inheritance" which are referred to in the question about financial improvements.

[40] Most workers' wages typically increase after a promotion. The results of Johnston and Lee (2013) can therefore also provide some insights on adaptation to income changes.

income and the comparison income. Further, empirical evidence on interpersonal preferences has been found for example by Luttmer (2005) and Smith (2015). The latter argue that an individual's reaction to a wage cut concerning work morale or job satisfaction, respectively, is driven by the perceived fairness of the wage change; i.e., if the wages of similar others are also cut. Our social comparison effect completely vanishes within two years after a wage change. Furthermore, when we additionally include the lead and lag effects of wage changes, most of the social comparison coefficients are no longer statistically significant. Thus, although intra- and interpersonal comparisons are found to have an effect on job satisfaction, the effect of the latter appears to play a minor role. This finding contradicts Ferrer-i-Carbonell (2005) to a certain extent, who conclude that social comparisons appear to be just as important as the individual's own income level with respect to life satisfaction. We suspect that our measures of intrapersonal comparisons may already capture certain aspects of our social comparison measure. Hence, we conclude that interpersonal comparisons matter, but that the inclusion of anticipation and adaptation dimensions considerably lowers their importance for job satisfaction.

7 Sensitivity analysis

In this section, we aim at checking the robustness of the results obtained in the previous section. We will do so by disentangling the possibly differing influence of a wage change on job satisfaction with respect to its direction, i.e., positive and negative. It seems plausible to assume an asymmetric effect if one considers that due to loss aversion individuals should react more strong to a wage decrease than an increase (Kahneman and Tversky, 1979). To do so, we rewrite equation (3) in the following way:

$$\begin{aligned} jobsat_{nt} =& \alpha_0 wch^{+}_{nt} + \alpha_1 wch^{+}_{nt+1} + \sum_{i=1}^{4} \alpha_{-i} wch^{+}_{nt-i} \\ &+ \gamma_0 wch^{-}_{nt} + \gamma_1 wch^{-}_{nt+1} + \sum_{i=1}^{4} \gamma_{-i} wch^{-}_{nt-i} \\ &+ \beta_0 dtp_{nt} + \beta_1 dtp_{nt+1} + \sum_{i=1}^{4} \beta_{-i} dtp_{nt-i} + \\ &+ X_{nt}\delta + f_n + \eta_t + \epsilon_{nt}. \end{aligned} \tag{4}$$

In equation (4), wch^{+}_{nt} is a dummy equal to 1, if an individual experienced a wage change above 10% in period t. wch^{+}_{nt+1} and wch^{+}_{nt-i} are the corresponding anticipation and adaptation dummies for periods $t+1$ and $t-i$. Analogously, wch^{-}_{nt} is a dummy equal to 1, if an individual experienced a wage change below -10% in period t, with wch^{-}_{nt+1} and wch^{-}_{nt-i} representing the corresponding anticipation and adaptation dummies. Thus, a wage change between -10% and 10% serves as reference category. We chose to restrict

our positive and negative dummies to values above 10% and below -10%, respectively, in order to catch important wage changes that are not confounded by reporting errors or temporary wage changes due to overtime pay received in the month of the survey.[41]

[Insert Table 4 about here]

Table 4 reports the results from equation (4). In column (1), we report results from an unconditional OLS regression, namely we regress job satisfaction on all wage change dummies. All coefficients except for the lead dummy of a positive wage change are statistically significant, and exhibit the expected signs. The dummies for the positive wage changes are positively associated with job satisfaction, and those for a negative change are negatively associated with job satisfaction. In column (2), we run a further OLS specification, where we condition the outcome on a vector of control variables X. The results remain qualitatively the same, where now the third and fourth lags of the negative wage change dummy are no longer statistically significant. This would mean, that individuals fully adapt to a wage decrease within three periods. However, we assume that significant wage decreases in full employment (we restricted our sample to as mentioned in Section 4) often occur through job changes, so that a part of the effect of the negative wage change dummies should have been absorbed by the job change dummies which are now included.[42] Once we control for individual time-invariant fixed effects (column (3)) and additionally include social comparison dummies (column (4)), the fourth lag of a positive wage change also becomes statistically insignificant, which supports full adaptation to an income change after three periods. Now with regard to the negative wage change dummies, all lags, except for the third, are statistically insignificant. Given that the lags are now predominantly statistically insignificant, we assume that, apart from the wage change dummies, the social comparison dummies also partly absorb the negative effect on job satisfaction, since it is likely that many of the realised wage decreases are due to industry-specific wage cuts or shocks that reduce overtime hours and the earnings associated with them. So, assuming that individuals compare themselves to their peers, it is easier to cope with a wage cut if it also applies to one's own peers. As for the social comparison effect itself, we still find a small statistical significance in the first lag.

The overall picture of our robustness check confirms our previous findings. In general, individuals react strongly to experiencing a wage change; however, its effect decreases over time. In contrast to our main specification, where we found partial adaptation, we observe full adaptation within four periods for the upside scenario or within the first

[41] Recall that the question concerning an individual's wage refers to the earnings gained in the previous month. Thus, minor changes because of an irregular overtime pay are possible despite a stable gross annual salary specified in the employment contract.

[42] This consideration is supported by a simple descriptive statistic (not reported here) that shows that the average wage decrease is larger for individuals who changed jobs than for individuals who did not change their job.

year for the negative outcome, respectively. However, the partial adaptation in our main specification is based on weak statistical significance (10% level), which makes the results from this robustness check even more comparable to the main results. Furthermore, our results seems to be driven mainly by positive wage changes.

8 Conclusion

Wage increases are one of the most common methods used by firms to stimulate employee motivation. On the superficial level, this seems to be a reasonable practice, since hardly anybody would argue that employees dislike positive wage changes. Nevertheless, it remains an open question whether positive wage changes really buy enhanced and persistent employee job satisfaction. Furthermore, recent empirical evidence has demonstrated the importance of considering social comparisons when dealing with aspects of individual well-being. Studies which focus solely on intrapersonal comparisons may therefore produce misleading results. In order to address these issues, we estimated a job satisfaction equation and simultaneously included a lead and lag structure of wage changes in our model (intrapersonal aspects) as well as social comparison factors (interpersonal aspects), using representative individual panel data for Germany between 1990 and 2013.

Our findings indicate that individuals anticipate wage changes one period prior to their actual occurrence. Further, our results show that people at least partially or even fully adapt to wage changes within a period of three to four years after a realised wage change. Furthermore, receiving a wage increase above one's respective peer group enhances individual job satisfaction. On the other hand, social comparisons appear to play a minor role in job satisfaction when simultaneously controlling for intraindividual comparisons. When we disentangled positive and negative wage changes, we found that individuals fully adapt to wage changes in both directions; however, adaptation to negative wage changes was faster than adaptation to positive wage changes.

Our results provide some important policy implications that are especially relevant for management. First of all, wage increases induce positive effects on employee job satisfaction in the short-run. However, these positive satisfaction effects appear not to be of a permanent nature, since people adapt to realised positive wage changes within a short period of time. Consequently, wage increases at frequent intervals may be a solution to achieve more enhanced and persistent employee motivation. In doing so, the frequency of wage increases should be aligned to the duration of adaptation. An additional wage increases should be paid before individuals return to their baseline satisfaction level. Seniority wages implement wage increases on a regular basis, as the wages raise with the employees' age or work experience. Nevertheless, automated wage increases may also have detrimental effects on employees' work effort, as the link between effort and financial outcomes is diluted. Regular promotions are another instrument for continuous

wage changes. Moreover, promotions are typically associated with a closer link between employee effort and financial outcomes.

Based on our evidence from the social comparison analysis, wage cuts appear to be more acceptable and have fewer negative effects on job satisfaction when wages are cut collectively; i.e., when similar others also experience wage cuts. It is therefore recommended that firms, when obliged to cut employees wages, should first consider their employees' relative wage situations. Finally, caution is advisable with respect to wage transparency. On the one hand, transparent wages may further stimulate employee motivation in recognition of an employee's superior work. On the other hand, transparent wages might have a disincentive effect on work moral, where an employee perceives his wages are below his peers' wages.

References

Adams, J. Stacy, "Towards an understanding of inequity," *Journal of Abnormal and Social Psychology*, 1963, *67* (5), 422–436.

_ , "Inequity in social exchange," *Advances in experimental social psychology*, 1965, *2*, 267–299.

Blanchflower, David G. and Andrew J. Oswald, "Well-being over time in Britain and the USA," *Journal of Public Economics*, 2004, *88* (7-8), 1359–1386.

Brickman, Philip and Donald T. Campbell, "Hedonic relativism and planning the good society," in M.H. Apley, ed., *Adaptation-level theory: A symposium*, New York: Academic Press, 1971, pp. 287–302.

_ **, Dan Coates, and Ronnie Janoff-Bulman**, "Lottery winners and accident victims: Is happiness relative?," *Journal of Personality and Social Psychology*, 1978, *36* (8), 917–927.

Burchardt, Tania, "Are one man's rags another man's riches? Identifying adaptive expectations using panel data," *Social Indicators Research*, 2005, *74* (1), 57–102.

Clark, Andrew E., "Are wages habit-forming? Evidence from micro data," *Journal of Economic Behavior & Organization*, 1999, *39* (2), 179–200.

_ , "Unemployment as a social norm: Psychological evidence from panel data," *Journal of Labor Economics*, 2003, *21* (2), 323–351.

_ , "A note on unhappiness and unemployment duration," IZA Discussion Paper Series 2406, PSE and IZA Bonn 2006.

_ **and Andrew J. Oswald**, "Satisfaction and comparison income," *Journal of Public Economics*, 1996, *61* (3), 359–381.

_ **and Claudia Senik**, "Who compares to whom? The anatomy of income comparisons in Europe," *Economic Journal*, 2010, *120* (544), 573–594.

_ **and Yannis Georgellis**, "Back to baseline in Britain: Adaptation in the British household panel survey," *Economica*, 2013, *80* (319), 496–512.

_ **, Ed Diener, Yannis Georgellis, and Richard E. Lucas**, "Lags and leads in life satisfaction: A test of the baseline hypothesis," *Economic Journal*, 2008b, *118* (529), F222–F243.

_ **, Paul Frijters, and Michael A. Shields**, "Relative income, happiness, and utility: An explanation for the Easterlin paradox and other puzzles," *Journal of Economic Literature*, 2008a, *46* (1), 95–144.

_ **, Yannis Georgellis, and Peter Sanfey**, "Job satisfaction, wage changes, and quits: Evidence from Germany," *Research in Labor Economics*, 1998, *17*, 95–121.

Di Tella, Rafael and Robert MacCulloch, "Some uses of happiness data in economics," *Journal of Economic Perspectives*, 2006, *20* (1), 25–46.

_ , **John Haisken-De New, and Robert MacCulloch**, "Happiness adaptation to income and to status in an individual panel," *Journal of Economic Behavior & Organization*, 2010, *76* (3), 834–852.

_ , **Robert J. MacCulloch, and Andrew J. Oswald**, "The macroeconomics of happiness," *Review of Economics and Statistics*, 2003, *85* (4), 809–827.

Duesenberry, James S., *Income, saving, and the theory of consumer behavior*, Harvard University Press, 1949.

Easterlin, Richard A., "Does economic growth improve the human lot? Some empirical evidence," in P.A. David and W.B. Melvin, eds., *Nations and Households in Economic Growth: Essays in Honour of Moses Abramovitz*, New York and London: Academic Press, 1974, pp. 89–125.

_ , "Will raising the incomes of all increase the happiness of all?," *Journal of Economic Behavior & Organization*, 1995, *27* (1), 35–47.

_ , "Is there an "iron law of happiness"?," Technical Report, Institute of Economic Policy Research 2005.

_ , "Paradox Lost?," IZA Discussion Paper Series 9676, University of Southern California and IZA Bonn 2016.

Ferrer-i-Carbonell, Ada, "Income and well-being: An empirical analysis of the comparison income effect," *Journal of Public Economics*, 2005, *89* (5), 997–1019.

_ **and Bernard M. S. van Praag**, "Do people adapt to changes in income and other circumstances? The discussion is not finished yet," Mimeo 2008.

_ **and Paul Frijters**, "How important is methodology for the estimates of the determinants of happiness?," *Economic Journal*, 2004, *114* (497), 641–659.

Festinger, Leon, "A theory of social comparison processes," *Human relations*, 1954, *7* (2), 117–140.

Frederick, Shane and George Loewenstein, "Hedonic adaptation," in Daniel Kahneman, Ed Diener, and Norbert Schwarz, eds., *Well-being: The foundations of hedonic psychology*, New York: Russell Sage Foundation, 1999, pp. 302–329.

Frey, Bruno S. and Alois Stutzer, "What can economists learn from happiness research?," *Journal of Economic Literature*, 2002, *40* (2), 402–435.

_ **and** _ , "Economic consequences of mispredicting utility," *Journal of Happiness Studies*, 2014, *15* (4), 937–956.

Frijters, Paul, David W. Johnston, and Michael A. Shields, "Life satisfaction dynamics with quarterly life event data," *Scandinavian Journal of Economics*, 2011, *113* (1), 190–211.

_ , **John P. Haisken-DeNew, and Michael A. Shields**, "Money does matter! Evidence from increasing real income and life satisfaction in East Germany following reunification," *American Economic Review*, 2004, *94* (3), 730–740.

Gardner, Jonathan and Andrew J. Oswald, "Do divorcing couples become happier by breaking up?," *Journal of the Royal Statistical Society: Series A (Statistics in Society)*, 2006, *169* (2), 319–336.

_ **and** _ , "Money and mental wellbeing: A longitudinal study of medium-sized lottery wins," *Journal of Health Economics*, 2007, *26* (1), 49–60.

Grund, Christian and Dirk Sliwka, "Reference-dependent preferences and the impact of wage increases on job satisfaction: Theory and evidence," *Journal of Institutional and Theoretical Economics*, 2007, *163* (2), 313–335.

_ **and Johannes Martin**, "Monetary Reference Points of Managers–Empirical Evidence of Status Quo Preferences and Social Comparisons," *Scottish Journal of Political Economy*, 2015.

Hamermesh, Daniel S., "The changing distribution of job satisfaction," *Journal of Human Resources*, 2001, *36* (1), 1–30.

Hanglberger, Dominik and Joachim Merz, "Does self-employment really raise job satisfaction? Adaptation and anticipation effects on self-employment and general job changes," *Journal for Labour Market Research*, 2015, *48* (4), 287–303.

Helson, Harry, "Adaptation-level as frame of reference for prediction of psychophysical data," *American Journal of Psychology*, 1947, *60* (1), 1–29.

_ , *Adaptation-level theory: An experimental and systematic approach to behavior*, New York: Harper and Row, 1964.

Hirschman, Albert O. and Michael Rothschild, "The changing tolerance for income inequality in the course of economic development," *Quarterly Journal of Economics*, 1973, *87* (4), 544–566.

Jevons, Herbert S., *Essays on economics*, London: Macmilan, 1905.

Johnston, David W. and Wang-Sheng Lee, "Climbing the job ladder: New evidence of gender inequity," *Industrial Relations: A Journal of Economy and Society*, 2012, *51* (1), 129–151.

_ **and** _ , "Extra status and extra stress: Are promotions good for us?," *Industrial & Labor Relations Review*, 2013, *66* (1), 32–54.

Kahneman, Daniel and Alan B. Krueger, "Developments in the measurement of subjective well-being," *Journal of Economic Perspectives*, 2006, *20* (1), 3–24.

_ **and Amos Tversky**, "Prospect theory: An analysis of decision under risk," *Econometrica*, 1979, *47* (2), 263–291.

Kosteas, Vasilios D., "Job satisfaction and promotions," *Industrial Relations: A Journal of Economy and Society*, 2011, *50* (1), 174–194.

Köszegi, Botond and Matthew Rabin, "A model of reference-dependent preferences," *Quarterly Journal of Economics*, 2006, *121* (4), 1133–1165.

Loewenstein, George, "Anticipation and the valuation of delayed consumption," *Economic Journal*, 1987, *97* (387), 666–684.

Lucas, Richard E., "Time does not heal all wounds: A longitudinal study of reaction and adaptation to divorce," *Psychological Science*, 2005, *16* (12), 945–950.

_ **and Andrew E. Clark**, "Do people really adapt to marriage?," *Journal of Happiness Studies*, 2006, *7* (4), 405–426.

_ **,** _ **, Yannis Georgellis, and Ed Diener**, "Reexamining adaptation and the set point model of happiness: Reactions to changes in marital status," *Journal of Personality and Social Psychology*, 2003, *84* (3), 527–539.

_ **,** _ **,** _ **, and** _ , "Unemployment alters the set point for life satisfaction," *Psychological Science*, 2004, *15* (1), 8–13.

Luttmer, Erzo F. P., "Neighbors as negatives: Relative earnings and well-being," *Quarterly Journal of Economics*, 2005, *120* (3), 963–1002.

Lydon, Reamonn and Arnaud Chevalier, *Estimates of the effect of wages on job satisfaction*, Centre for Economic Performance, London School of Economics and Political Science, 2002.

Markowitz, Harry, "The utility of wealth," *Journal of Political Economy*, 1952, *60* (2), 151–158.

McBride, Michael, "Relative-income effects on subjective well-being in the cross-section," *Journal of Economic Behavior & Organization*, 2001, *45* (3), 251–278.

_ , "Money, happiness, and aspirations: An experimental study," *Journal of Economic Behavior & Organization*, 2010, *74* (3), 262–276.

Oswald, Andrew J. and Nattavudh Powdthavee, "Does happiness adapt? A longitudinal study of disability with implications for economists and judges," *Journal of Public Economics*, 2008, *92* (5), 1061–1077.

Powdthavee, Nattavudh, "What happens to people before and after disability? Focusing effects, lead effects, and adaptation in different areas of life," *Social Science & Medicine*, 2009, *69* (12), 1834–1844.

_ , "How much does money really matter? Estimating the causal effects of income on happiness," *Empirical Economics*, 2010, *39* (1), 77–92.

_ , "Anticipation, free-rider problems, and adaptation to trade unions: Re-examining the curious case of dissatisfied union members," *Industrial & Labor Relations Review*, 2011, *64* (5), 1000–1019.

Rudolf, Robert and Sung-Jin Kang, "Adaptation under traditional gender roles: Testing the baseline hypothesis in South Korea," Technical Report, Courant Research Centre: Poverty, Equity and Growth-Discussion Papers 2011.

Senik, Claudia, "Income distribution and well-being: What can we learn from subjective data?," *Journal of Economic Surveys*, 2005, *19* (1), 43–63.

Smith, Jennifer C., "Pay growth, fairness, and job satisfaction: Implications for nominal and real wage rigidity," *Scandinavian Journal of Economics*, 2015, *117* (3), 852–877.

Stutzer, Alois, "The role of income aspirations in individual happiness," *Journal of Economic Behavior & Organization*, 2004, *54* (1), 89–109.

_ **and Bruno S. Frey**, "Does marriage make people happy, or do happy people get married?," *Journal of Socio-Economics*, 2006, *35* (2), 326–347.

van Praag, Bernard M. S., "The welfare function of income in Belgium: An empirical investigation," *European Economic Review*, 1971, *2* (3), 337–369.

Wagner, Gert G., Joachim R. Frick, and Jürgen Schupp, "The German Socio-Economic Panel study (SOEP) - scope, evolution and enhancements," *Schmollers Jahrbuch*, 2007, *127* (1), 139–169.

Zimmermann, Anke C. and Richard A. Easterlin, "Happily ever after? Cohabitation, marriage, divorce, and happiness in Germany," *Population and Development Review*, 2006, *32* (3), 511–528.

Tables and figures

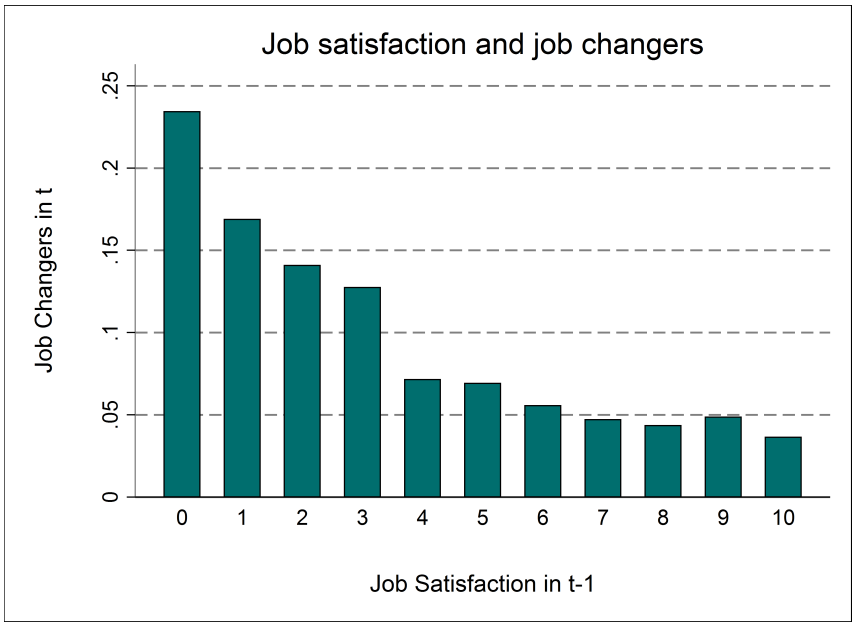


Figure 1: Job satisfaction and job changes

Notes: The above figure plots the percentage of job changers in t (Y-axis) against their indicated job satisfaction in t-1 (X-axis).
Source: German Socio-Economic Panel (SOEP), years 1990-2013, own calculations.

Table 1: Descriptive statistics of job satisfaction

Job satisfaction	N (male)	N (female)
"Totally unhappy" (0)	88	38
1	130	43
2	389	120
3	801	307
4	978	416
5	2,500	1,043
6	2,835	1,035
7	5,161	1,917
8	6,984	2,376
9	2,867	899
"Totally happy" (10)	1,231	448
Total	23,964	8,642

Note: N is the number of observations.
Source: German Socio-Economic Panel (SOEP), years 1990-2013, own calculations.

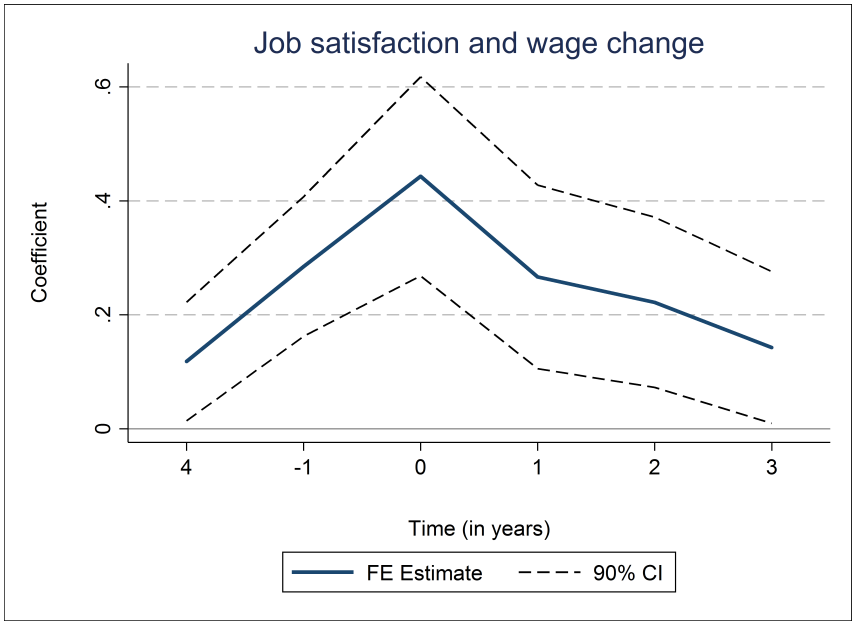
Table 2: Summary statistics of the main variables of the job satisfaction analysis

Variable	Mean	Std	within-Std	Min	Max
Job satisfaction	6.94	1.86	1.21	0.0	10.0
Wage change	0.04	0.15	0.14	−0.5	1.0
Peer group wage change	0.04	0.15	0.13	−0.9	4.4
Gross income	3,000	1,599	489	410	34,054
Peer income	2,914	1,177	461	588	19,155

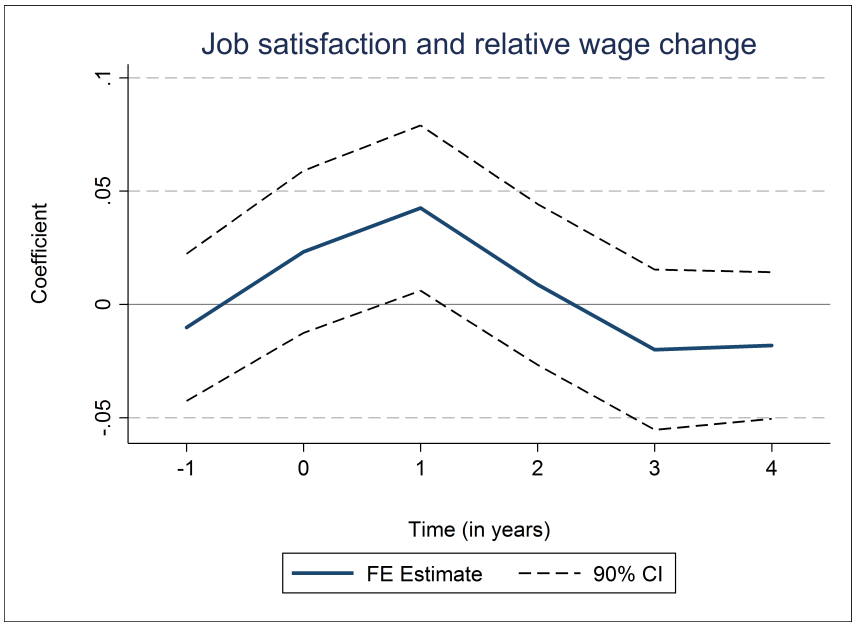
Notes: The number of observations is 32,606. Std is the standard deviation, within-Std is the within standard deviation. Gross and peer income values are denoted in Euro and rounded to full digits.
Source: German Socio-Economic Panel (SOEP), years 1990-2013, own calculations.

Figure 2

(a)



(b)



Notes: The above figure plots the estimated coefficients of equation (3), which are denoted by the blue line, and the 90% confidence interval (grey dashed line). Figure 2a plots the estimated coefficients of wage changes in periods t-4 to t+1, and Figure 2b plots the estimated coefficients of the peer group dummies in period t-4 to t+1.
Source: German Socio-Economic Panel (SOEP), years 1990-2013, own calculations.

Table 3: Job satisfaction and wage changes

Dependent variable	**Job satisfaction**					
	(1) OLS	(2) OLS	(3) FE	(4) FE	(5) FE	(6) FE
Wage change $t+1$				0.267***		0.285***
				(0.065)		(0.074)
Wage change t	0.547***	0.288***	0.200***	0.484***		0.443***
	(0.061)	(0.061)	(0.067)	(0.099)		(0.106)
Wage change $t-1$				0.342***		0.267***
				(0.091)		(0.098)
Wage change $t-2$				0.239***		0.222**
				(0.084)		(0.091)
Wage change $t-3$				0.111		0.143*
				(0.074)		(0.081)
Wage change $t-4$				0.089		0.118*
				(0.056)		(0.063)
Peer group dummy $t+1$					0.027	−0.010
					(0.017)	(0.020)
Peer group dummy t					0.066***	0.023
					(0.020)	(0.022)
Peer group dummy $t-1$					0.057***	0.043*
					(0.020)	(0.022)
Peer group dummy $t-2$					0.025	0.009
					(0.020)	(0.022)
Peer group dummy $t-3$					−0.011	−0.020
					(0.019)	(0.021)
Peer group dummy $t-4$					−0.004	−0.018
					(0.017)	(0.020)
Controls	NO	YES	YES	YES	YES	YES
Observations	32,606	32,606	32,606	32,606	32,606	32,606
Adj. R^2 / R^2-within	0.002	0.140	0.047	0.060	0.059	0.060

Notes: */**/*** denotes statistical significance at the 10/5/1% level. The values in parentheses represent heteroskedasticity-robust standard errors (columns (1)-(2)) and robust standard errors clustered at the individual-level (columns (3)-(5), 5,924 individuals and 5.5 years). The descriptive statistics for *job satisfaction* is provided in Section 4. The specifications in columns (2)-(5) contain a set of covariates introduced in Section 5.
Source: German Socio-Economic Panel (SOEP), years 1990-2013, own calculations.

Table 4: Job satisfaction and asymmetric wage changes

Dependent variable	**Job satisfaction**			
	(1) OLS	(2) OLS	(3) FE	(4) FE
Positive wage change $t+1$	0.027	0.016	0.015	0.039
	(0.026)	(0.025)	(0.023)	(0.024)
Positive wage change t	0.206***	0.131***	0.112***	0.099***
	(0.027)	(0.026)	(0.027)	(0.028)
Positive wage change $t-1$	0.175***	0.131***	0.119***	0.096***
	(0.027)	(0.026)	(0.025)	(0.027)
Positive wage change $t-2$	0.153***	0.113***	0.080***	0.069***
	(0.025)	(0.025)	(0.025)	(0.026)
Positive wage change $t-3$	0.095***	0.078***	0.039*	0.050**
	(0.025)	(0.024)	(0.023)	(0.025)
Positive wage change $t-4$	0.067***	0.054**	0.019	0.016
	(0.024)	(0.023)	(0.021)	(0.023)
Negative wage change $t+1$	−0.121***	−0.114***	−0.109***	−0.076**
	(0.034)	(0.032)	(0.031)	(0.032)
Negative wage change t	−0.200***	−0.124***	−0.122***	−0.108***
	(0.036)	(0.034)	(0.035)	(0.035)
Negative wage change $t-1$	−0.163***	−0.076**	−0.044	−0.032
	(0.035)	(0.034)	(0.034)	(0.035)
Negative wage change $t-2$	−0.120***	−0.063*	−0.045	−0.039
	(0.037)	(0.035)	(0.034)	(0.035)
Negative wage change $t-3$	−0.107***	−0.042	−0.055*	−0.069**
	(0.038)	(0.035)	(0.033)	(0.034)
Negative wage change $t-4$	−0.077**	−0.028	−0.010	−0.016
	(0.037)	(0.035)	(0.031)	(0.032)
Peer group dummy $t+1$				0.002
				(0.019)
Peer group dummy t				0.027
				(0.022)
Peer group dummy $t-1$				0.038*
				(0.022)
Peer group dummy $t-2$				0.009
				(0.022)
Peer group dummy $t-3$				−0.033
				(0.022)
Peer group dummy $t-4$				−0.005
				(0.020)
Controls	NO	YES	YES	YES
Observations	32,606	32,606	32,606	32,606
Adj. R^2 / R^2-within	0.006	0.141	0.049	0.060

Notes: */**/*** denotes statistical significance at the 10/5/1% level. The values in parentheses represent heteroskedasticity-robust standard errors (columns (1) - (2)) and robust standard errors clustered at the individual-level (columns (3)-(4), 5,924 individuals and 5.5 years). The descriptive statistics for *job satisfaction* is provided in Section 4. The specifications in columns (2)-(4) contain a set of covariates introduced in Section 5.
Source: German Socio-Economic Panel (SOEP), years 1990-2013, own calculations.

Appendix

Table A.1: Definition and descriptive statistics of all variables used in the job satisfaction analysis

Variable	Definition	Mean	Std	Min	Max
Job satisfaction	Job satisfaction indicated on a 0 ("totally unhappy") to 10 ("totally happy") scale	6.94	1.86	0	10
Wage change t+1	Wage change of employee in t+1 divided by 100	0.03	0.15	-0.5	1
Wage change t	Wage change of employee in t divided by 100	0.04	0.15	-0.5	1
Wage change t-1	Wage change of employee in t-1 divided by 100	0.04	0.15	-0.5	1
Wage change t-2	Wage change of employee in t-2 divided by 100	0.05	0.16	-0.5	1
Wage change t-3	Wage change of employee in t-3 divided by 100	0.05	0.16	-0.5	1
Wage change t-4	Wage change of employee in t-4 divided by 100	0.06	0.17	-0.5	1
Pos. wage change t+1	Dummy variable indicating whether employee's wage change was above 10% in t+1	0.21	0.41	0	1
Pos. wage change t	Dummy variable indicating whether employee's wage change was above 10% in t	0.22	0.42	0	1
Pos. wage change t-1	Dummy variable indicating whether employee's wage change was above 10% in t-1	0.23	0.42	0	1
Pos. wage change t-2	Dummy variable indicating whether employee's wage change was above 10% in t-2	0.25	0.43	0	1
Pos. wage change t-3	Dummy variable indicating whether employee's wage change was above 10% in t-3	0.27	0.44	0	1
Pos. wage change t-4	Dummy variable indicating whether employee's wage change was above 10% in t-4	0.29	0.45	0	1
Neutr. wage change t+1	Dummy variable indicating whether employee's wage change was in between -10% to 10% in t+1	0.66	0.47	0	1
Neutr. wage change t	Dummy variable indicating whether employee's wage change was in between -10% to 10% in t	0.66	0.47	0	1
Neutr. wage change t-1	Dummy variable indicating whether employee's wage change was in between -10% to 10% in t-1	0.65	0.48	0	1
Neutr. wage change t-2	Dummy variable indicating whether employee's wage change was in between -10% to 10% in t-2	0.64	0.48	0	1
Neutr. wage change t-3	Dummy variable indicating whether employee's wage change was in between -10% to 10% in t-3	0.62	0.48	0	1
Neutr. wage change t-4	Dummy variable indicating whether employee's wage change was in between -10% to 10% in t-4	0.61	0.49	0	1
Neg. wage change t+1	Dummy variable indicating whether employee's wage change was below -10% in t+1	0.12	0.33	0	1

Continued on next page...

... Table A.1 continued

Variable	Definition	Mean	Std	Min	Max
Neg. wage change t	Dummy variable indicating whether employee's wage change was below -10% in t	0.12	0.32	0	1
Neg. wage change t-1	Dummy variable indicating whether employee's wage change was below -10% in t-1	0.11	0.32	0	1
Neg. wage change t-2	Dummy variable indicating whether employee's wage change was below -10% in t-2	0.11	0.32	0	1
Neg. wage change t-3	Dummy variable indicating whether employee's wage change was below -10% in t-3	0.11	0.31	0	1
Neg. wage change t-4	Dummy variable indicating whether employee's wage change was below -10% in t-4	0.11	0.31	0	1
Peer group t+1	Dummy variable indicating whether employee's wage change will be higher than his peer group's wage change in t+1	0.49	0.5	0	1
Peer group t	Dummy variable indicating whether employee's wage change was higher than his peer group's wage change in t	0.5	0.5	0	1
Peer group t-1	Dummy variable indicating whether employee's wage change was higher than his peer group's wage change in t-1	0.51	0.5	0	1
Peer group t-2	Dummy variable indicating whether employee's wage change was higher than his peer group's wage change in t-2	0.5	0.5	0	1
Peer group t-3	Dummy variable indicating whether employee's wage change was higher than his peer group's wage change in t-3	0.5	0.5	0	1
Peer group t-4	Dummy variable indicating whether employee's wage change was higher than his peer group's wage change in t-4	0.5	0.5	0	1
Job change t+1	Dummy variable indicating whether employee will change his job in t+1	0.05	0.22	0	1
Job change t	Dummy variable indicating whether employee changed job in t	0.06	0.23	0	1
Job change t-1	Dummy variable indicating whether employee changed job in t-1	0.06	0.23	0	1
Job change t-2	Dummy variable indicating whether employee changed job in t-2	0.06	0.24	0	1
Job change t-3	Dummy variable indicating whether employee changed job in t-3	0.07	0.26	0	1
Job change t-4	Dummy variable indicating whether employee changed job in t-4	0.09	0.28	0	1
Male	Dummy variable indicating whether respondent is male	0.73	0.44	0	1
Age	Age of respondent	44.33	8.9	22	64
Age squared	Age of respondent squared and divided by 100	20.44	7.93	4.84	40.96
Foreign nationality	Dummy variable indicating whether respondent is of non-German nationality	0.11	0.31	0	1
Schooling	Years of schooling	12.19	2.58	7	18

Continued on next page...

... Table A.1 continued

Variable	Definition	Mean	Std	Min	Max
Marital status	Dummy variable indicating whether respondent has a settled living partner	0.81	0.39	0	1
Children aged under 16	Dummy variable indicating whether respondent has one or more children aged under 16 who currently live in the household	0.38	0.49	0	1
Monthly gross wage	Gross wage of respondent in the month before the survey	3000	1599	410	34,054
Fixed-term contract	Dummy variable indicating whether an employee has a fixed-term contract	0.02	0.12	0	1
Job tenure	Years of job tenure	14.25	9.5	0	49.8
Part-time experience	Years of experience in a part-time job	0.59	2	0	31.2
Unemployment experience	Years of unemployment experience	0.3	0.83	0	15.3
Actual working hours	Actual weekly working hours	43.45	6.88	0	99.9
Firm size 1-19	Dummy variable indicating whether employee works in a firm with 1 to 19 employees (serves as reference category in the analysis)	0.16	0.36	0	1
Firm size 20-199	Dummy variable indicating whether employee works in a firm with 20 to 199 employees	0.29	0.46	0	1
Firm size 200-1999	Dummy variable indicating whether employee works in a firm with 200 to 1999 employees	0.28	0.45	0	1
Firm size $\geq$ 2000	Dummy variable indicating whether employee works in a firm with equal or more than 2000 employees	0.27	0.44	0	1
Hobbies and other leisure activities	Number of hours devoted to hobbies and other leisure activities on a typical working day	1.57	1.27	0	24
Current health: very good	Dummy variable indicating whether respondent assesses her current health status as very good (serves as reference category in the analysis)	0.07	0.26	0	1
Current health: good	Dummy variable indicating whether respondent assesses her current health status as good	0.49	0.5	0	1
Current health: satisfactory	Dummy variable indicating whether respondent assesses her current health status as satisfactory	0.34	0.47	0	1
Current health: poor	Dummy variable indicating whether respondent assesses her current health status as poor	0.09	0.29	0	1
Current health: bad	Dummy variable indicating whether respondent assesses her current health status as bad	0.01	0.1	0	1
Occupation dummies	11 occupational dummies				
Regional dummies	16 regional dummies				
Sector dummies	9 dummy variables for the industry a respondent is employed in				
Time dummies	19 dummies for the survey years 1994-2012				

Notes: The number of observations is 32,606. Std is the standard deviation. The monthly gross wage is denoted in Euro and rounded to full digits.

Source: German Socio-Economic Panel (SOEP), years 1990-2013, own calculations.